

Cardiovascular-Related Hospitalization among Michigan Adults (2018)**Major cardiovascular disease listed as primary diagnosis per 100,000 Michigan adults (18 years and older)**

Characteristics	Hospital Discharges	Unadjusted		Age-adjusted	
		Discharges per 100,000 MI adults	95% CI	Discharges per 100,000 MI adults	95% CI
Michigan	171,579	2,193.6	(2,183.3, 2,203.8)	1,814.0	(1,805.3, 1,822.6)
Age Group (Years)					
18-24	617	64.3	(59.2, 69.4)	~	~
25-34	2,263	174.9	(167.7, 182.1)	~	~
35-44	5,980	514.8	(501.8, 527.8)	~	~
45-54	16,350	1,267.3	(1,248.0, 1,286.6)	~	~
55-64	34,169	2,436.1	(2,410.6, 2,461.7)	~	~
65-74	44,732	4,457.5	(4,417.1, 4,497.9)	~	~
75 and older	67,468	9,504.8	(9,436.5, 9,573.0)	~	~
Gender					
Male	93,269	2,447.6	(2,432.1, 2,463.1)	2,129.6	(2115.9, 2143.3)
Female	78,309	1,952.2	(1,938.7, 1,965.8)	1,532.1	(1521.2, 1543.0)
Race					
Non-Hispanic White	135,399	2,221.9	(2,210.2, 2,233.6)	1,702.4	(1,693.3, 1,711.6)
Non-Hispanic Black	32,616	3,058.5	(3,025.8, 3,091.1)	3,013.6	(2,980.8, 3,046.3)

95% CI – 95% Confidence Interval; ~ – Not Applicable

The following ICD-10 CM diagnosis codes were used to define major cardiovascular disease (Major CVD): diseases of the heart (I00-I09, I11, I13, I20-I51), cerebrovascular disease (I60-I69), and diseases of the arteries, arterioles and capillaries (I70-I78).

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Diseases of the heart as primary diagnosis per 100,000 Michigan adults (18 years and older)

Characteristics	Hospital Discharges	Unadjusted		Age-adjusted	
		Discharges per 100,000 MI adults	95% CI	Discharges per 100,000 MI adults	95% CI
Michigan	130,923	1,673.8	(1,664.8, 1,682.8)	1,385.0	(1,377.4, 1,392.5)
Age Group (Years)					
18-24	496	51.7	(47.1, 56.2)	~	~
25-34	1,806	139.5	(133.1, 146.0)	~	~
35-44	4,685	403.3	(391.8, 414.9)	~	~
45-54	12,610	977.4	(960.4, 994.4)	~	~
55-64	25,555	1,822.0	(1,799.9, 1,844.1)	~	~
65-74	33,735	3,361.7	(3,326.4, 3,396.9)		
75 and older	52,036	7,330.7	(7,270.1, 7,391.4)		
Gender					
Male	71,671	1,880.8	(1,867.2, 1,894.5)	1,638.5	(1,626.4, 1,650.5)
Female	59,252	1,477.1	(1,465.3, 1,488.9)	1,157.5	(1,148.0, 1,166.9)
Race					
Non-Hispanic White	103,355	1,696.1	(1,685.8, 1,706.3)	1,299.0	(1,290.9, 1,307.0)
Non-Hispanic Black	24,885	2,333.5	(2,304.9, 2,362.2)	2,299.7	(2,271.1, 2,328.3)

95% CI – 95% Confidence Interval; ~ – Not Applicable

ICD-10 CM codes were defined as diseases of the heart (I00-I09, I11, I13, I20-I51).

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Heart attack listed as primary diagnosis per 100,000 Michigan adults (18 years and older)

Characteristics	Hospital Discharges	Unadjusted		Age-adjusted	
		Discharges per 100,000 MI adults	95% CI	Discharges per 100,000 MI adults	95% CI
Michigan	25,176	321.9	(317.9, 325.8)	267.8	(264.5, 271.1)
Age Group (Years)					
18-24	25.0	2.6	(1.6, 3.6)	~	~
25-34	172.0	13.3	(11.3, 15.3)	~	~
35-44	1,020.0	87.8	(82.4, 93.2)	~	~
45-54	3,218.0	249.4	(240.8, 258.0)	~	~
55-64	5,993.0	427.3	(416.5, 438.1)	~	~
65-74	6,376.0	635.4	(619.8, 650.9)	~	~
75 and older	8,372.0	1,179.4	(1154.3, 1204.6)	~	~
Gender					
Male	15200	398.9	(392.6, 405.2)	347.8	(342.2, 353.3)
Female	9976	248.7	(243.8, 253.6)	195.9	(192.0, 199.8)
Race					
Non-Hispanic White	20648	338.8	(334.2, 343.4)	263.8	(260.2, 267.5)
Non-Hispanic Black	3911	366.7	(355.3, 378.2)	360.1	(348.8, 371.4)

95% CI – 95% Confidence Interval; ~ – Not Applicable

ICD-10 CM diagnosis codes I21 and I22 were used to define heart attack.

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Stroke listed as primary diagnosis per 10,000 Michigan adults (18 years and older)

Characteristics	Hospital Discharges	Unadjusted		Age-adjusted	
		Discharges per 10,000 MI adults	95% CI	Discharges per 10,000 MI adults	95% CI
Michigan	33,013	42.2	(41.8, 42.7)	34.8	(34.4, 35.2)
Age Group (Years)					
18-24	85	0.9	(0.7, 1.1)	~	~
25-34	364	2.8	(2.5, 3.1)	~	~
35-44	1,056	9.1	(8.5, 9.6)	~	~
45-54	3,033	23.5	(22.7, 24.3)	~	~
55-64	6,695	47.7	(46.6, 48.9)	~	~
65-74	8,709	86.8	(85.0, 88.6)	~	~
75 and older	13,071	184.1	(181.0, 187.3)	~	~
Gender					
Male	16,754	44.0	(43.3, 44.6)	38.1	(37.5, 38.7)
Female	16,258	40.5	(39.9, 41.2)	31.8	(31.4, 32.3)
Race					
Non-Hispanic White	25,725	42.2	(41.7, 42.7)	32.3	(31.9, 32.7)
Non-Hispanic Black	6,508	61.0	(59.5, 62.5)	60.1	(58.7, 61.6)

95% CI – 95% Confidence Interval; ~ – Not Applicable

ICD-10 CM diagnosis codes I60-I69 were used to define stroke.

Hospital length of stay

Length of stay	Major Cardiovascular Disease		Heart Disease		Heart Attack		Stroke	
	Days	Std	Days	Std	Days	Std	Days	Std
Average length of stay	5.2	+/- 5.7	4.9	+/- 5.2	4.7	+/- 4.8	6.3	+/- 7.0
Median length of stay	4		4		3.0		4	
Most frequent length of stay	2		2		2.0		1	

Std – Standard deviation (applies only to average)
See methods for ICD-10 CM definitions.

Data Sources and Reference

Michigan Resident Inpatient Files created using data from the Michigan Inpatient Database (MIDB) obtained with permission from the Michigan Health & Hospital Association Service Corporation, 2018.

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United States Department of Health and Human Services (US DHHS), Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), Bridged-Race Population Estimates, United States July 1st resident population by state, county, age, sex, bridged-race, and Hispanic origin, on CDC WONDER On-line Database (2018).

Klein RJ, Schoenborn CA. Age adjustment using the 2000 projected U.S. population. Healthy People Statistical Notes, no. 20. Hyattsville, Maryland: National Center for Health Statistics. January 2001.

Definition

Confidence Interval (CI): A range about a measurement within which we would expect the “true” number of hospitalizations (hospital discharges) among the population. A 95% CI can be interpreted as the following: If we took 100 measurements and calculated 100 confident intervals, we would be 95% sure that the true hospital discharge rate among the adult Michigan population would fall within a certain range 95% of the time and outside the range 5% of the time. The wider the interval means the more imprecise the measurement, the narrower the interval the more precise the measurement.

Methods and Limitations

The hospital discharge rates (hospitalization rates) were determined using hospital discharge counts among Michigan adults (18 years and older) as the numerator and the estimated number of Michigan adults (18 years and older) as the denominator. The Michigan Residence Inpatient Files provided data on hospital discharges. Discharges listed as primary ICD-10 CM diagnosis codes were used to define the following cardiovascular conditions:

- 1) major cardiovascular disease was diseases of the heart (I00-I09, I11, I13, I20-I51); cerebrovascular disease (I60-I69), and diseases of the arteries, arterioles and capillaries(I70-I78);
- 2) diseases of the heart (I00-I09, I11, I13, I20-I51);

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- 3) heart attack disease was defined as (I21 and I22);
- 4) stroke was defined as I60-I69.

Because hospital discharges are not individual persons, the hospital discharge rates may not necessarily reflect rates of disease per person with a cardiovascular condition; that is, persons who are hospitalized more than once in a year may be counted more than once.

The denominator was estimated from the 2018 adult Michigan bridged-race population estimate. Age-adjusted rates were rates adjusted to the 2000 U.S. Standard Population using three age groups (18–44, 45–64, 65+ years). Rates indicated as unadjusted were rates that were not age-adjusted. Confidence intervals were 95%.